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XEROX

1 December 1961
GSG Report No. 1610.30/170
SD 61-212

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MONTHLY PROGRESS REPORT
ON THE
FEASIBILITY AND DESIGN STUDY FOR COLLECTIVE
PROTECTION EQUIPMENT FOR THE AN/MSG-4 SYSTEM

CONTRACT NO: DA 18-108 CML-6618

REPORT PERIOD: Technical Report, 1 November 1961 to 1 December 1961
(5th Month)
Financial Report, 1 November 1961 to 1 December 1961
(5th Month)

TO: Commanding Officer
U. S. Army Chemical Research and
Development Laboratories

ATTENTION: Contract Project Officer
U. S. Army Chemical Center
Edgewood, Maryland

PURPOSE OF THE STUDY

The purpose of this study is to evaluate the feasibility of installing collective protection (air filtration) equipment on semitrailer vans, trucks, and air-transportable shelters that contain the various subsystems of the AN/MSG-4 Antiaircraft Defense System. The collective protection equipment will include: a chemical, bacteriological, and radiological (CBR) filter for filtering irritating, noxious, and toxic gases and aerosols from the air; a pressure-control device to maintain minimum pressure of the air conditioning system; and an air lock that permits personnel to make safe entry and exit from the various vehicles and shelters. Mockups of proposed CBR filters and a mockup of a protective entrance will be fabricated following completion of the initial phase of the feasibility study. The activities during the month of November are described on the following pages.

GENERAL

On the 14th and 15th of November, Mr. Mears of the U. S. Army Chemical Center, Maryland, visited the Hughes Aircraft Company, Fullerton, California. The purpose of the visit was to review layout designs of a CBR Filter assembly and a Protective Entrance prior to fabrication of the mockups. Mr. Mears offered ideas for improving the designs and pointed out areas in need of further investigation. The main items discussed during Mr. Mears' visit are recorded in "Minutes of Meeting, 14 November 1961 thru 15 November 1961, Phase I Study, Collective Protection Equipment."

During this visit Mr. Mears requested that the Radar Surveillance Central AN/GSS-1D System be included in the feasibility study. It was resolved that the scope of this study effort will be comparable to the effort expended for each vehicle/shelter in Contract DA 18-108 CML-6618 except that mockups of the Protective Entrance and CBR Filter will not be provided.

In a discussion between Mr. Mears and Hughes engineering representatives, the following priority was established on mockups to be completed under Phase I of the existing contract within the limits of the funding:

1. (In Process) CBR Filter assembly mockup of the type to support AN/MSQ-28 (except AN/MPS-23 Antenna Trailer), AN/MSQ-18, and AN/TSQ-38 trailers/shelters; and Protective Entrance assembly mockup of the type for AN/MSQ-28 and AN/MSQ-18 trucks.
2. (Funds Permitting) CBR Filter assembly mockup for the AN/MPS-23 Radar Antenna Trailer.
3. (Funds Permitting) Protective Entrance for the AN/TSQ-38 shelter.

During the month of November, study effort was expended in determining the air-flow requirements of the AN/MPS-23 Radar Antenna Trailer CBR Filter and analyzing the requirements of the AN/GSS-1D System to correctly establish the design criteria for the collective protection equipment. The designs already established for the CBR Filter (AN/MSQ-28, AN/MSQ-18, and AN/TSQ-38) and Protective Entrance (AN/MSQ-28, WMC, and RET) were reviewed, and certain design changes suggested by Mr. Mears were incorporated. These changes are discussed fully in the appropriate paragraphs of this report. The revised drawings were released for fabrication near the end of the reporting period.

STUDY PROGRESS

CBR Filter (AN/MPS-23 Radar Antenna Trailer)

Three designs are being evaluated for the CBR Filter for the AN/MPS-23 Radar Antenna Trailer. The basis for two of the designs (A and B) is the utilization of surplus capacity in the two existing radome blowers. The basis of the third design (C) is the utilization of an integral blower.

1. In design A the gas and particulate filters are interchangeable with those used in the CBR Filter for the AN/MSQ-28 (except AN/MPS-23 Radar Antenna Trailer), AN/MSQ-18, and AN/TSQ-38 Systems. The filter is mounted in the radome when in operation.
2. Design B utilizes the combination gas-aerosol filter media rather than separate gas and particulate filters. The filter is mounted in the radome when in operation.
3. Design C utilizes the same filters as design A. The filter is mounted external to the radome and is a push-through rather than a pull-through filter as in the case of designs A and B. This design eliminates the necessity of installing the filter in the radome each time the antenna is relocated, since filters A and B cannot be permanently installed in the radome.

CBR Filter (AN/GSS-1 Shelter)

Analysis of the AN/GSS-1 Configuration

The AN/GSS-1 shelter was studied during this period. The shelter is divided into two sections by a partition comprised of three sliding panels. One section is the personnel area, and the other, located behind the sliding panels, is the equipment compartment. Located in this area are the power supply (PP-674/TPS-1D), signal comparator (CM-36/TPS-1D), radar modulator (MD-144/TPS-1D), receiver-transmitter (RT-212/TPS-1D), antenna base (AB-221/TPS-1D), and the azimuth-range indicator (1P-141/TPS-1D). Ambient air is used to cool the equipment and is drawn into the compartment through ventilators near the corner where the roadside and forward walls meet. The air is drawn through the compartment and exhausted by a centrifugal blower which has the suction side connected by a flexible duct to the equipment compartment. The blower is located in the shelter and discharges the air to the ambient atmosphere.

An identical centrifugal blower draws air directly from the personnel section of the shelter and exhausts it to the atmosphere. When the personnel blower is in operation, ambient air is drawn through a louvered ventilator in the curbside wall of the shelter. A remote air conditioner

can be supplied for cooling the personnel space in lieu of using ambient air. Two duct adapters are provided which attach to the curbside window and the operator's compartment ventilator.

The shelter is heated with a 60,000-Btu gasoline-burning heater using 28-volt d-c power for blower operation and ignition. Fresh air enters the fan plenum section through a louvered ventilator on the road-side wall. Recirculation air from the operator's space mixes with the fresh air in the fan intake plenum. A decontamination opening is provided in the curbside wall to which the filtered air can be ducted from the CBR Filter. The quantity of filtered air required has not been determined but is expected to be large to prevent excessively high equipment-operating temperatures. It is expected that the capacity required will be in excess of that deliverable by the filter proposed for the AN/MSQ-28 (except AN/MPS-23 Radar Equipment Trailer), AN/MSQ-18, and AN/TSQ-38 Systems. The air-flow requirement will be determined as a part of this study.

Figure 1 shows the method of air distribution when cooling the personnel and equipment in the AN/GSS-1D shelter with ambient air. Figure 2 shows the method of distributing filtered air when under CBR protection.

The trailer-mounted gasoline engine generator set (PU-253/U) that supplies power to the AN/GSS-1D System is comprised of two gasoline engine generator sets (PU-107/U) mounted in a type M-105 two-wheel trailer. The PU-107/U generator has a 400-cps single-phase output of 118-120 volts, 10 kw, 104 amp (maximum) and a d-c output of 28 volts, 2.5 kw, 90 amp. The specification power requirement for the AN/GSS-1D Radar Surveillance Central is 7.82 kw at 115 volts, 400-cps a-c and 1.4 kw at 28 volts d-c. Sufficient d-c power is not available for CBR Filter motor blower operation. However, 400-cps power is available for filter operation if both PU-107/U generators are used. Space is not available on the AN/GSS-1D shelter for a permanently mounted CBR Filter, and therefore a separate means of conveyance will be required.

Recommendations on Support of the AN/GSS-1D System

To utilize a CBR Filter assembly with the AN/GSS-1D shelter, the following tentative procedures would apply:

- During CBR protection, the ventilators in the forward and curbside walls supplying air to the equipment section must be closed. Although contaminated air could be used for equipment cooling without contaminating the operator's compartment, it should not be used because residual contamination would make equipment repair impossible. A new opening must be provided in the equipment compartment sliding panel adjacent to the curbside wall to allow filtered air to enter the equipment compartment for cooling.

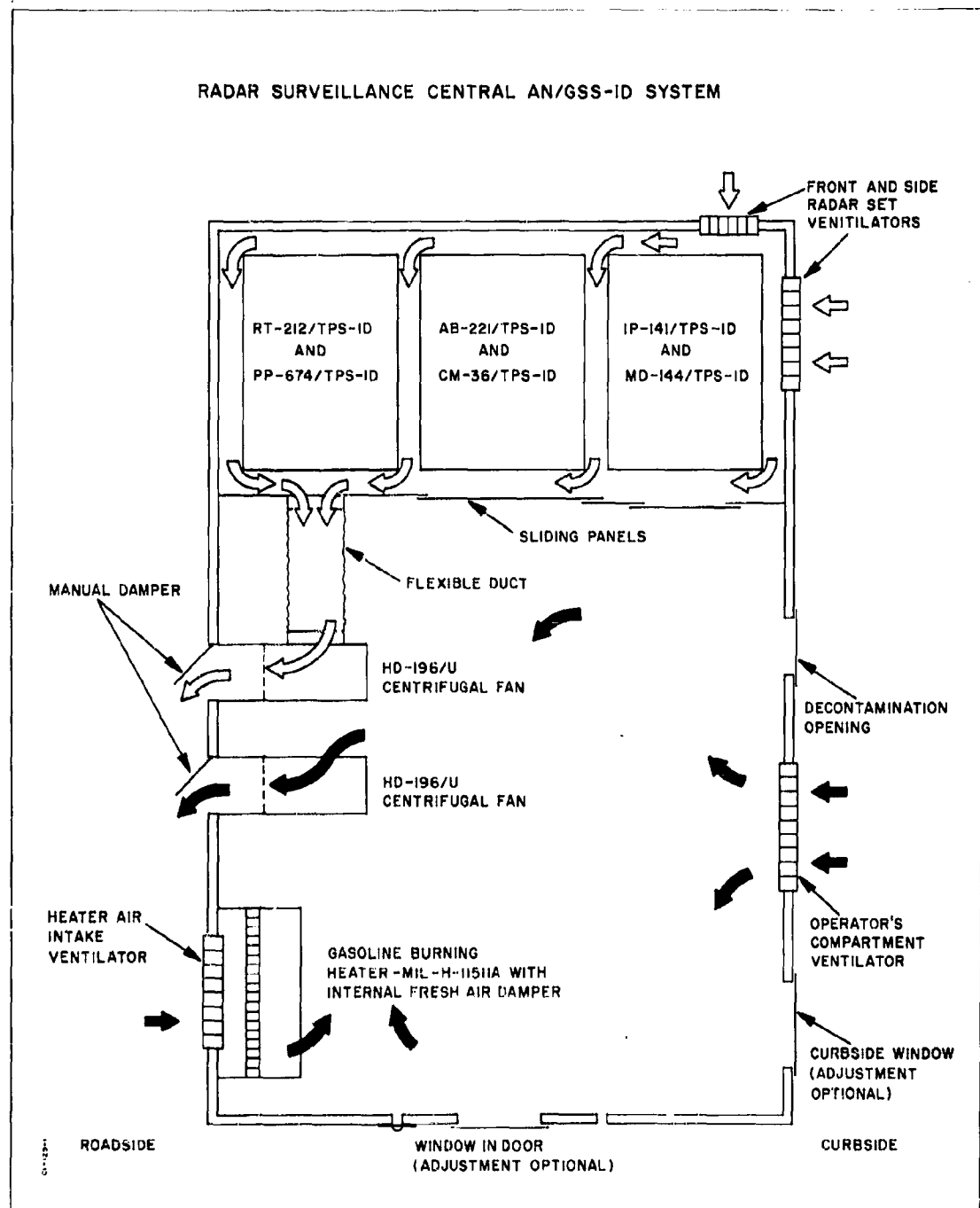


Figure 1 Equipment Compartment: Cooled by Ambient Air
Operator's Compartment: Cooled by Ambient Air

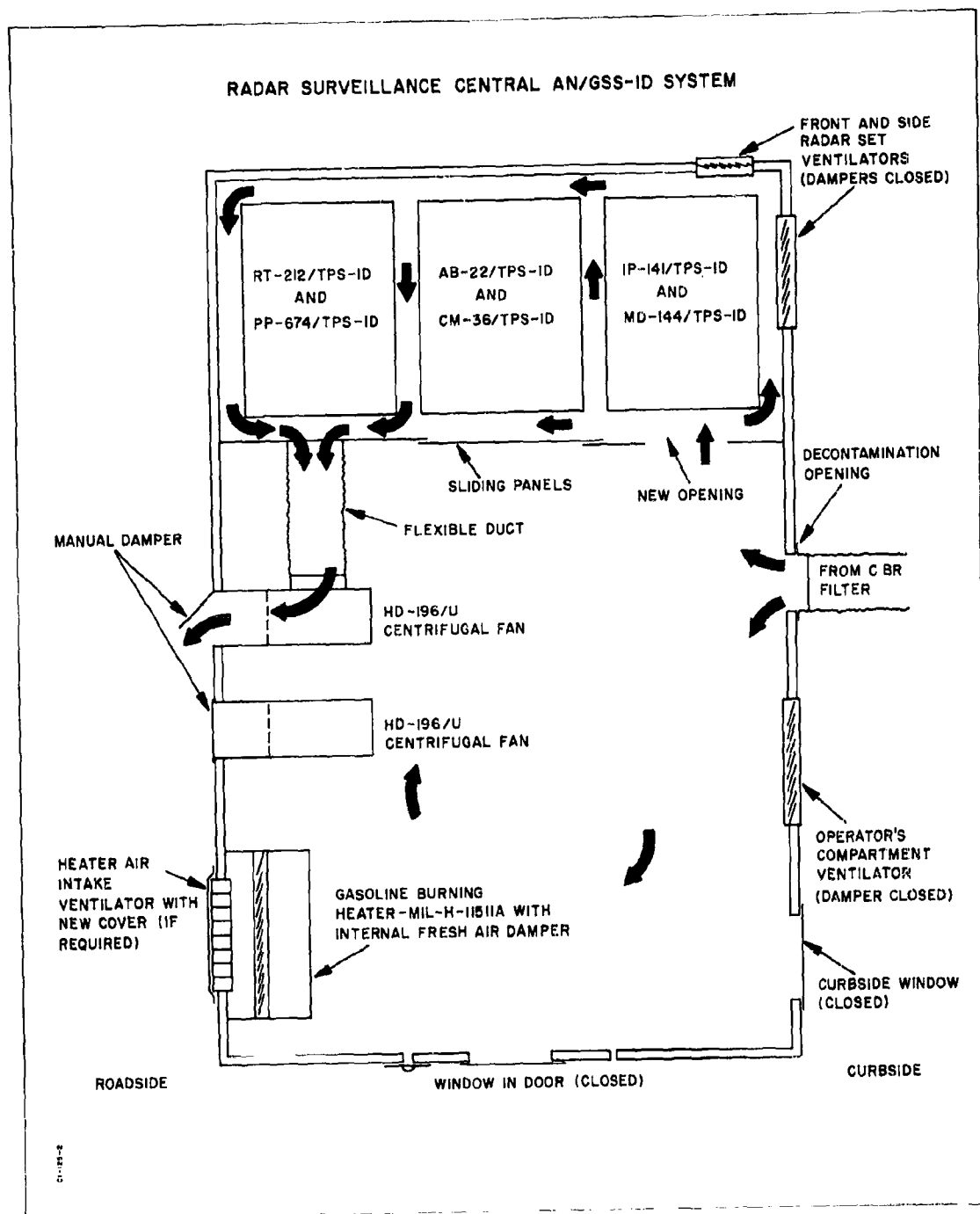


Figure 2 Equipment Compartment: Cooled by CBR Air
Operator's Compartment: Cooled by CBR Air

- The heater ventilator on the roadside wall must be covered to prevent excessive loss of filtered air.
- The manual damper on the discharge of the blower serving the operator's space must be closed and the blower stopped. The blower serving the equipment section may be required to operate with its manual damper in a partially closed position.
- It is recommended that if a remote air conditioner is employed to cool the operator's compartment, it should not be used during CBR protection. The curbside window and ventilator to which the air conditioner ducts attach must be closed.

Protective Entrance (AN/GSS-1D Shelter)

Technical Manual TM 11-1162 indicates that the AN/GSS-1D equipment can be operated when the shelter is mounted on an M35 truck or M8E2 Cargo Carrier. It is assumed, however, that most of the time the shelter will be mounted on the ground, and therefore the Protective Entrance should be designed accordingly. The problems encountered are similar to those of the AN/TSQ-38 Helihut, and therefore a similar design is recommended. The AN/TSQ-38 Protective Entrance design concept is fully described in the 4th Monthly Technical Report covering the period from 1 October to 1 November 1961. If the shelter were to be mounted on a vehicle, a supporting platform could be inserted under the Protective Entrance. The platform would be accessible by means of a ladder.

DESIGN PROGRESS

CBR Filter (AN/MSQ-28, AN/MSQ-18, and AN/TSQ-38)

During the design review of the CBR Filter unit serving the AN/MSQ-28, AN/MSQ-18, and AN/TSQ-38 Systems, Mr. Mears suggested that the automatic damper might be too large to effectively control the air flow. He further suggested that it would be advantageous to have a means of manually controlling the air leaving the discharge plenum of the CBR Filter. Subsequent to the design review, the mockup design was revised. The damper section was decreased in area and relocated from its position immediately downstream from the prefilter to a position between the discharge of the blower and the plenum which supplies air to the particulate filters. The new damper is of the opposed blade type. A manual damper was added to each discharge connection to facilitate the balancing of air flows.

An interference problem was found between the filter unit and the protective cover snap pins on the side of the air conditioners. The width

of the filter unit was decreased to provide space for the manual detachment of the air conditioner cover from the snap pins. In making this modification to the width of the unit, the filter frame sizes were revised from 37-3/4 by 16 by 2 inches to 40-3/4 by 18 by 1-3/4 inches — a size calculated to give a comparable filter life factor. Particular attention was devoted to the design of the weather shield to assure the lowest possible velocity of the entering air.

CBR Filter (AN/MPS-23 Radar Antenna Trailer)

Although several alternate filter designs are being reviewed for use with the AN/MPS-23 Radar Antenna Trailer, some design progress has been made. If separate particulate and gas filters are used, much of the existing filter design can be used. In the event the combination gas-aerosol filter media is selected, a basic design concept has already been established.

Protective Entrance

After the review with Mr. Mears of the design for the Protective Entrance mockup for the AN/MSQ-28 RDPC, WMC, and RET vehicles, a modification has been made to incorporate a second window for improved inside lighting. The method of supporting the entrance from the top has also been slightly modified. The eye-bolt has been replaced by a ring. Two of the nylon web belts sewn to the top of the entrance pass through the ring. This change will increase the durability of the Protective Entrance and will eliminate a potential air leak.

FABRICATION PROGRESS

CBR Filter Mockup — AN/MSQ-28 (Except AN/MPS-23 Radar Antenna Trailer), AN/MSQ-28 and AN/TSQ-38

The majority of the drawings for the CBR Filter assembly mockup were released during the latter part of the reporting period. Prior to the end of the reporting period, the plenum and filter frames which are made of wood were completed. The aluminum main frame of the assembly and numerous items of hardware were in work.

Protective Entrance Mockup (AN/MSQ-28 RDPC, WMC, and RET Vehicles)

The fabric assembly of the Protective Entrance is being manufactured under subcontract by the Canvas Specialty Manufacturing Company

of Los Angeles. The company has a background of experience in manufacturing items from butyl and neoprene-covered nylon material. The material being used is a 16-ounce neoprene-covered nylon material. Metal parts of the mockup, such as the door framing and supporting members, are in process at the Hughes facility.

PLANNED ACTIVITY FOR THE NEXT REPORTING PERIOD

During the month of December 1961 it is expected that the following work will be completed:

- The fabrication and assembly of the CBR Filter assembly mockup for the AN/MSQ-28, AN/MSQ-18, and AN/TSQ-38 vehicle/shelters.
- The fabrication and assembly of the Protective Entrance assembly mockup for the AN/MSQ-28 WMC and RDPC vehicles. This mockup will be attached to an actual AN/MSQ-28 trailer for evaluation and demonstration.
- The above mockups will be evaluated by the Customer.
- The design concept for the AN/MPS-24 Antenna Trailer CBR Filter will be finalized, and the mockup design will be released for fabrication.
- The feasibility study will be continued on the AN/CSS-1D Shelter to determine air-flow rates, power requirements, and the size of the CBR Filter required.
- An outline of material will be prepared for the writing of the final report.

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